Medical Journal of Bakırköy

Med J Bakirkoy 2026;22(1):60-66
DOI: 10.4274/BMJ.galenos.2025.2025.4-9

Research

The Impact of Nicotine Dependence on Cough Capacity and Respiratory Symptoms in Young Adults

Genç Yetişkinlerde Nikotin Bağımlılığının Öksürük Kapasitesi ve Solunum Semptomları Üzerindeki Etkisi

Beyzanur Dikmen Hoşbaş[1], Şevval Arduç[1], Rüstem Mustafaoğlu[2]

[1]Üsküdar University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, İstanbul, Türkiye

[2]İstanbul University-Cerrahpaşa Faculty of Health Sciences, Department of of Physiotherapy and Rehabilitation, İstanbul, Türkiye

ABSTRACT

Objective: The aim of this study was to investigate the effect of nicotine dependence on cough capacity, respiratory symptoms, and cough-related quality of life in young adults.

Methods: A total of 101 university students, both smokers and non-smokers, who met the inclusion criteria were included in the study. Nicotine dependence status of smokers, cough capacity of both groups, and cough-related quality of life were evaluated in the study.

Results: When peak cough flow values were analysed, a statistically significant difference was found between the groups (p=0.045). When the Leicester Cough Questionnaire physical, psychological, social sub-dimensions, and total score were analysed, no statistically significant difference was found between the groups (p=0.599, p=0.333, p=0.077, p=0.154; respectively). A weak negative correlation was found between nicotine dependence level and peak cough flow in smokers (r=-0.297, p=0.02).

Conclusion: According to the results of the study, smoking has harmful effects on lung function, which causes a significant decrease in peak cough flow rate. In addition, as the nicotine dependence level of smokers increased, peak cough flow decreased. The deterioration of lung function and more respiratory symptoms reported by smokers may affect quality of life.

Keywords: Cigarette smoking, cough, peak expiratory flow rate, pulmonary functions, quality of life

ÖZ

Amaç: Bu çalışmanın amacı genç erişkinlerde nikotin bağımlılığının öksürük kapasitesi, solunum semptomları ve öksürükle ilişkili yaşam kalitesi üzerine etkisini araştırmaktır.

Gereç ve Yöntem: Çalışmaya dahil edilme kriterlerini karşılayan sigara içen ve içmeyen toplam 101 üniversite öğrencisi dahil edildi. Çalışmada sigara içenlerin nikotin bağımlılık durumu, her iki grubun öksürük kapasitesi ve öksürükle ilişkili yaşam kalitesi değerlendirildi.

Bulgular: Tepe öksürük akım değerleri incelendiğinde gruplar arasında istatistiksel olarak anlamlı fark bulundu (p=0,045). Leicester Öksürük Anketi fiziksel, psikolojik, sosyal alt boyutları ve toplam puanı incelendiğinde gruplar arasında istatistiksel olarak anlamlı bir fark bulunmadı (sırasıyla p=0,599, p=0,333, p=0,077, p=0,154). Sigara içenlerde nikotin bağımlılık düzeyi ile tepe öksürük akımı arasında negatif yönde zayıf bir korelasyon bulundu (r=-0,297, p=0,02).

Sonuç: Çalışma sonuçlarına göre, sigara içmenin akciğer fonksiyonları üzerinde zararlı etkileri vardır ve sigara içmek tepe öksürük akım hızında anlamlı bir azalmaya neden olmaktadır. Ayrıca sigara içenlerin nikotin bağımlılık düzeyi arttıkça tepe öksürük akımı azalmıştır. Akciğer fonksiyonlarının bozulması ve sigara içenlerin daha fazla solunum semptomu bildirmesi yaşam kalitesini etkileyebilir.

Anahtar Kelimeler: Sigara içmek, öksürük, tepe ekspiratuvar akış hızı, solunum fonksiyonları, yaşam kalitesi

Address for Correspondence: Beyzanur Dikmen Hoşbaş, MSc, Üsküdar University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, İstanbul, Türkiye
E-mail: beyzanur.dikmenhosbas@uskudar.edu.tr **ORCID ID:** orcid.org/0000-0003-2494-480X

Cite as: Dikmen Hoşbaş B, Arduç Ş, Mustafaoğlu R. The impact of nicotine dependence on cough capacity and respiratory symptoms in young adults. Med J Bakirkoy. 2026;22(1):60-66

Received: 16.04.2025
Accepted: 08.07.2025
Publication Date: 12.03.2026

INTRODUCTION

Nicotine, the primary psychoactive substance in tobacco leaves, has resulted in the widespread use of tobacco and more than one billion smokers worldwide (1). While smoking rates have decreased in numerous high-income nations, tobacco consumption remains prevalent in many low- and middle-income countries. According to the global burden of disease study, the global smoker population was projected to reach around 1.14 billion by 2019, an increase from just under 1 billion in 1990 (1). In Türkiye, this global trend shows similar patterns. In a study conducted in 2022 with 286 high school students in Türkiye, the prevalence of any tobacco product use among young people was found to be 32.2%. This study shows that 3 out of 10 young people are on their way to becoming addicted (2). Most smokers develop a dependency on the nicotine delivered by cigarettes (3). Due to neuroadaptive changes and psychological processes resulting from regular nicotine intake through cigarettes, quitting tobacco can trigger a well-known withdrawal syndrome. This typically presents as irritability, anxiety, a depressed mood, concentration difficulties, increased hunger, sleep disturbances, and restlessness, all of which make cessation challenging (4). Smoking poses serious health risks, primarily affecting the respiratory and cardiovascular systems. It can lead to lung damage by harming the airways and alveoli. Smoking-related lung conditions include emphysema and chronic obstructive pulmonary disease (5). Smoking can affect the respiratory function of young people (6). Smoking has been shown to cause acute changes in the lungs, such as increased airflow resistance, coughing, and airway irritation. The airways become irritated, mucus production increases, and lung tissue is damaged. Cough capacity is a person's maximum expiratory flow rate, measured by the peak cough flow rate. When the airways are narrowed, cough capacity is reduced. Reduced cough capacity is a major cause of pulmonary complications leading to morbidity and mortality (7). Few studies have examined the effects of smoking on respiratory function in young people (8). Providing smokers with information about their lung function may help increase their motivation to quit smoking (9). Consequently, this study aimed to objectively assess the impact of smoking on cough capacity among university students who smoke. Our hypothesis is that smokers will have a lower cough capacity than non-smokers and that peak cough flow will decrease as the degree of smoking dependence increases. To the best of the authors' knowledge, no research has yet examined the impact of tobacco dependence on cough capacity in young adults in Türkiye. This study is distinct in this context and aims to add valuable insights to the existing literature.

METHODS

This cross-sectional observational study was conducted at the Physiotherapy and Rehabilitation Application and Research Centre of Üsküdar University from July 2024 to January 2025. The study was approved by the Ethics Committee for Non-Interventional Clinical Research of Üsküdar University (approval no: 2024-55, date: 29.06.2024) and was conducted in accordance with the Declaration of Helsinki. Participants were recruited through face-to-face interviews and were divided into two groups: smokers (study group, n=61) and non-smokers (control group, n=41). All participants were given both verbal and written information about the study, and written informed consent was obtained from each participant.

Participants and Procedure

Sample size was determined by an a priori power analysis using G*Power 3 (Heinrich Heine University, Düsseldorf, Germany) (10). The required sample size to achieve a power of 0.90 with an alpha of 0.05 is at least n=34 per group when using Cohen's d=0.80 (11). Based on this, the study sample was composed of 61 smokers (study group) and 40 non-smokers (control group). Participants in the study group were university students of both genders, aged 18-24 years, who had been smoking for more than 1 year. Subjects who refused to sign the written informed consent, those with unstable cardiopulmonary, neuromuscular or musculoskeletal disorders that may affect the accuracy of the study results, those with systemic acute infective diseases such as anemia, heart diseases, pulmonary infective pathology, any recent upper respiratory or lower respiratory tract infection, lung cancer, human immunodeficiency virus, pneumonia, tuberculosis, among others, and those who participated in regular exercise training in the last six weeks, were excluded. The control group consisted of subjects of both genders, aged between 18-24 years, who did not use any tobacco product, cooperated with the measurements and volunteered to participate in the study.

Measures

Sociodemographic and clinical information of the participants was recorded. In the study, nicotine dependence status of the smoker group and peak cough flow rate, determining the cough capacity of both groups, were evaluated with a digital peak flow meter, and cough-related quality of life was evaluated with the Leicester Cough Questionnaire (LCQ).

Data Collection Tools

Sociodemographic and Clinical Information Form: Gender, age, education, body weight, height, and body mass index (BMI), presence of cough (present/absent),

type (productive/non-productive), duration (number/day), sputum complaints, dyspnea, age at initiation of smoking, and daily amount of cigarettes smoked were questioned and recorded.

Fagerstrom Nicotine Dependence Test: Nicotine dependence status of the subjects was determined with the Fagerstrom Nicotine Dependence Test. The Fagerstrom Nicotine Dependence Test is a self-assessment scale consisting of 6 questions providing a dichotomous and quadruple Likert-type measurement between 0-1 and 0-3. It is used to assess the risk, level of severity, and change in terms of physical dependence on nicotine in individuals. (12). The reliability coefficient of the test is 0.56. According to the scores obtained from the scale; 8-10 points are "very high level nicotine addict;" 6-7 points are "high level nicotine addict;" 5 points are "medium level nicotine addict;" 3-4 points are "low level nicotine addict" and 0-2 points are "very low level nicotine addict" (12).

Cough Capacity: The procedure for using the ExpiRite Peak Flow Meter® (Clement Clarke International Ltd., Harlow, UK) was thoroughly explained to all participants. They were instructed to inhale as deeply as possible and then exhale forcefully and quickly into the device. Participants were instructed to seal their lips around the peak flow meter while seated, ensuring that they exhaled in a single breath without placing their tongue on the tip of the device. Measurements were taken three times and the highest reading was recorded (13).

Leicester Cough Questionnaire: The LCQ is a questionnaire designed to assess the quality of life in individuals with chronic cough, developed in the United Kingdom. It consists of 19 items across three domains: physical, psychological, and social. The topics included in the LCQ were chosen using the clinical impact factor approach, which prioritizes issues identified by patients as problematic and ranks them based on their perceived significance. These issues are then categorized into domains using clinical reasoning (14). The questionnaire is completed using a seven-point Likert scale, where higher scores reflect better health. The overall score is the sum of the three domains, namely: physical, psychological, and social. The Turkish reliability and validity of the LCQ in chronic cough patients (15) has been conducted.

Statistical Analysis

All statistical analyses were performed using Statistical Package for Social Science (SPSS) version 20.0 for Windows (SPSS, Inc., Chicago, IL, USA). Descriptive statistics, including frequencies and percentages for categorical variables, and means and standard deviations for continuous variables, were computed. The normality of the data distribution was tested using the Kolmogorov-Smirnov test. Parametric tests (independent sample t-test) were used to compare normally distributed variables between groups, while non-parametric tests (Mann-Whitney U test) were applied for non-normally distributed variables. Categorical variables were analyzed using the chi-square test. The relationship between smoking addiction levels and peak cough flow was assessed with the Spearman's correlation test. Spearman's correlation coefficients were interpreted as follows: no association (0-0.19), weak (0.20-0.39), moderate (0.40-0.69), strong (0.70-0.89), and very strong (0.90-1). The significance level was accepted as $p<0.05$.

RESULTS

A comparison of the sociodemographic and clinical characteristics of the participants is presented in Table 1. The average age of participants in the study group was 21.16±1.81 years, while the control group had an average age of 21.25±1.64 years. Significant differences were observed between the study and control groups in terms of weight, height, and BMI values ($p<0.05$). When analyzing self-reported respiratory symptoms, including cough, dyspnea, and sputum, statistically significant differences were found between the study and control groups ($p<0.05$, $p=0.001$, $p=0.002$, $p=0.001$; respectively).

The distribution of self-reported respiratory symptoms including cough, dyspnea, and sputum according to the groups is shown in Figure 1.

The percentage distribution of respiratory symptoms of the individuals in the study group is shown in Figure 2. Cough was found in 47.5% of the individuals in the study group, dyspnea in 37.7%, and sputum in 34.4%.

When the peak cough flow values were analysed, a statistically significant difference was found between individuals in the study group and individuals in the control group ($p<0.05$; $p=0.045$) (Table 2). When the LCQ physical, psychological, social sub-dimensions, and total score were analyzed, no statistically significant difference was found between the individuals in the study group and the individuals in the control group ($p>0.05$; $p=0.599$, $p=0.333$, $p=0.077$, $p=0.154$; respectively).

A weak negative correlation was found between nicotine dependence level and peak cough flow in smokers ($r=-0.297$, $p<0.05$; $p=0.02$) (Table 3).

Table 1. Comparison of sociodemographic and clinical characteristics of individuals

		Study group (n=61) Mean±SD	Control group (n=40) Mean±SD	p-value*
Age (years)		21.16±1.81	21.25±1.64	0.95**
Weight (kg)		77.81±13.26	67.85±15.44	**0.001***
Height (cm)		175.46±7.54	168.70±8.65	**<0.001***
BMI (kg/m²)		25.19±3.37	23.60±3.82	**0.03***
Age at initiation of smoking (years)		17.22±2.48	-	
Duration of smoking (years)		3.97±2.76	-	
Amount of cigarette use (pcs/day)		18.14±10.14	-	
Gender	**Female** **Male**	15 (24.6) 46 (75.4)	17 (42.5) 23 (57.5)	0.058***
Degree of smoking dependence	**Very low** **Low** **Medium** **High** **Very high**	19 (31.1) 10 (16.4) 7 (11.5) 15 (24.6) 10 (16.4)	- - - - -	
Respiratory symptoms				
Cough	**Yes** **No**	29 (47.5) 32 (52.5)	3 (7.5) 37 (92.5)	**<0.001****
Dyspnea	**Yes** **No**	23 (37.7) 38 (62.3)	4 (1) 36 (90)	**0.002****
Sputum	**Yes** **No**	21 (34.4) 40 (65.6)	2 (5) 38 (95)	**0.001****

*: Independent sample t-test, **: Mann-Whitney U test, ***: Chi-square test, p<0.05 statistical significance, n: Number of people, SD: Standard deviation, kg: Kilogram, m: Metre, Study group: Individual smokers, Control group: Non-smokers

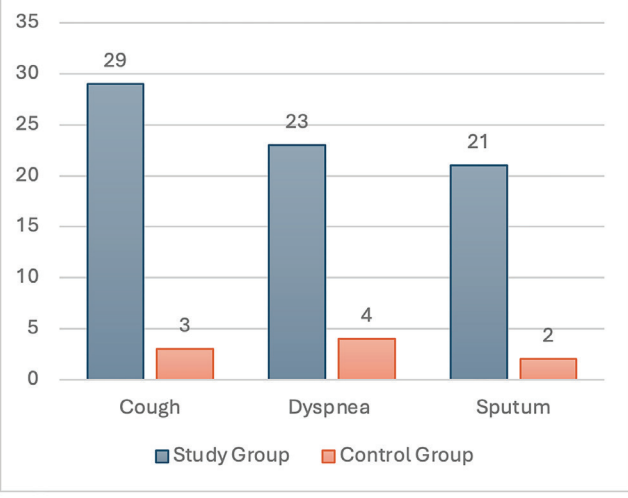

Figure 1. Distribution of respiratory symptoms of individuals according to groups

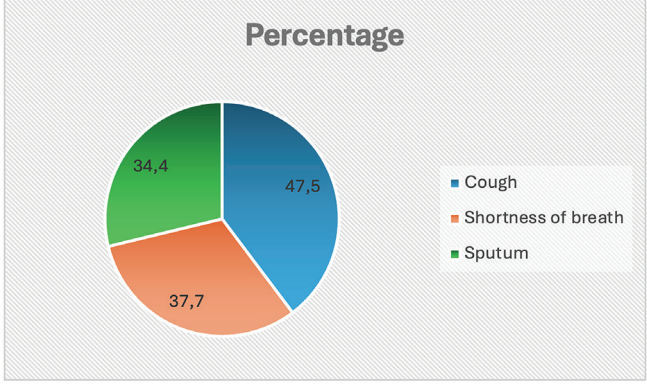

Figure 2. Percentage distribution of respiratory symptoms in the study group

DISCUSSION

The objective of this study was to assess lung function in healthy young smokers and non-smokers through the measurement of peak expiratory flow rate. The results revealed that smokers exhibited significantly lower cough capacity compared to non-smokers. While no significant difference was observed in the overall cough-related quality of life questionnaire score, the smoking group scored lower on both the sub-parameters and the total score of the questionnaire compared to the non-smoking group. Additionally, the study found that peak cough flow was negatively correlated with increasing nicotine dependence among smokers. This may indicate that increasing nicotine exposure progressively weakens expiratory muscle function. When self-reported respiratory symptoms were analysed, smokers reported more cough, dyspnoea, and sputum symptoms.

Table 2. Comparison of respiratory muscle strength and peak cough flow values of individuals

	Study group (n=61) Mean±SD	Control group (n=40) Mean±SD	p-value*
Peak cough flow (L/min)	445.00±135.90	455.50±138.74	0.045*
Leicester Cough Questionnaire subscales			
Physical	5.89±1.05	6.04±0.86	0.599**
Psychological	5.96±1.11	6.17±0.90	0.333**
Social	6.25±1.14	8.02±9.60	0.077**
Total	18.12±2.93	18.84±2.41	0.154**

*: Independent sample t-test, **: Mann-Whitney U test, p<0.05 statistical significance. n: Number of people, SD: Standard deviation, l: Liter, min: Minute, Study group: Individual smokers, Control group: Non-smokers, Study group: Individuals who smoke p<0.05 statistical significance

Table 3. The relationship between nicotine dependence level and cough capacity in smokers

	Degree of smoking dependence
Study group	**rho (p)**
Peak cough flow (L/min)	-0.297 (0.02)

L: Liter, min: Minute, rho: Spearman's correlation coeffidient

Smoking has become increasingly common among university students (16). In addition, smoking prevalence is higher in men than in women (1). In the literature, smoking prevalence was found to be higher in men than in women (17). In our study, the prevalence of smoking was found to be higher in male individuals, at 75.4%. Many studies have shown conflicting results regarding the relationship between smoking and BMI, with differences observed according to gender and/or race (18). In a study involving young men, daily smokers were found to have a higher average BMI compared to non-smokers (18). In our study, the BMI of smokers was found to be significantly higher than that of non-smokers. It is suggested that this may be due to less physically active lifestyles and poor dietary habits.

It is a serious problem that the increasing tendency to smoke tobacco, especially in young people, affects lung function (19). The early stages of airflow obstruction caused by tobacco smoking are reversible; however, if left untreated, they may progress to irreversible obstructive lung disease (20). Tobacco smoking is associated with cough, wheezing, sputum production, and dyspnoea. Respiratory symptoms (chronic cough, wheezing, asthma, dyspnea) have been reported among young adults (19). Research on tobacco use has demonstrated a link between smoking during adolescence and the development of asthma, as well as respiratory symptoms such as coughing, phlegm, wheezing, and shortness of breath (5). A cross-sectional study conducted on adolescents found a link between e-cigarette use and a higher risk of experiencing cough and sputum (21). Similarly, when self-reported respiratory symptoms were analysed in our study, it was found that smokers reported significantly more cough, dyspnea, and sputum-related symptoms. In the studies conducted, when the peak cough flow rate value was compared smokers and non-smokers, it was concluded that it decreased in smokers (22,23). It was also observed that mean peak cough flow velocity values decreased as smoking duration increased (23). One study found that smokers had lower peak cough flow velocity values than nonsmokers, even if they were asymptomatic (24).

In our study, we concluded that young adult smokers had significantly lower cough capacity compared to non-smokers, and that there was a negative relationship between peak cough flow rate and nicotine dependence. Recurrent inflammation is a frequent and persistent pathological finding that destroys alveolar walls in smokers, and this may be cause of the decrease in peak cough flow rate. This could also be attributed to the cumulative harmful effects of tobacco smoke on the airways over time. It is well-established that exposure to cigarette smoke leads to airway inflammation. The combined impact of the direct harmful effects of cigarette smoke and the indirect damage caused by the inflammatory response results in several epithelial alterations, including squamous metaplasia, increased mucous gland activity, changes in mucociliary clearance, and fibrotic transformations (25). All these changes lead to thickening of the bronchial wall, resulting in narrowing of the airway and restriction of flow (26). These mechanisms may explain the reduced peak cough flow observed in our sample of young smokers.

Cough has been significantly associated with deterioration in health-related quality of life in several general population studies (27,28). Cough is frequently comorbid in smokers and may affect quality of life (29). In a study, a significant long-term deterioration in quality of life was observed in smokers compared to never smokers (29). In our study, it was found that there was no significant difference in the cough-related quality of life questionnaire score in the smoker group compared to the non-smoker group; however, the sub-parameters and total score of the questionnaire were lower in the smoker group. In this respect, our study is consistent with previous studies in terms of the negative effect of cough on quality of life in smokers. It can be inferred that the deterioration of lung function and reporting more respiratory symptoms in smokers may prevent participation in daily activities and consequently affect general well-being and quality of life.

Study Limitations

The current study has some limitations, such as the small sample size and the fact that the study population consisted of young adults from only one university. There are also limitations such as sample inhomogeneity in height and weight data, reliance on self-reported data, and gender imbalance with a predominance of males in both groups. Future large-scale studies with more objective assessments are needed to analyze subgroups based on age, gender, or level of nicotine dependence.

CONCLUSION

Early detection of airflow obstruction and smoking cessation can result in significant health gains. Understanding the harmful effects of smoking is crucial for effective smoking control. Smoking accelerates the natural decline in pulmonary function with age, which is why adult and adolescent smokers typically exhibit lower lung function compared to non-smokers. Our study results indicate that smoking significantly impairs lung function, particularly decreasing the peak cough flow rate. Furthermore, as nicotine dependence increases, peak cough flow tends to decrease. Cigarette smoking remains the leading cause of preventable death worldwide. The use of all tobacco products should be strongly discouraged, especially among university students where smoking is prevalent and efforts should be made to specifically raise awareness among young adults. Coordinated approaches to tobacco prevention, cessation, and control are vital for creating a smoke-free environment. If smoking is halted at an early stage, the initial signs of airway obstruction can be reversed, allowing for normal lung function. Awareness and motivational programs are essential to discourage healthy young individuals from smoking. Moreover, to encourage young adult smokers to quit, it is important to provide accurate data on the health risks associated with smoking and its impact on pulmonary function. Despite the fact that smoking is a major health issue, there is limited research assessing pulmonary function in youth smokers and university students who smoke. Increasing awareness of the health effects of smoking through effective interventions that provide information about the harms of smoking may increase the intention to quit smoking among university students who smoke. To the best of our knowledge, there is no study evaluating the effect of tobacco addiction on cough capacity in young adults, including university students in our country. Our study is unique in this respect and will contribute to the literature. We think that there is a need for future studies with a larger sample size that represents the whole population, in which lung functions are evaluated in more detail.

ETHICS

Ethics Committee Approval: The study was approved by the Ethics Committee for Non-Interventional Clinical Research of Üsküdar University (approval no: 2024-55, date: 29.06.2024) and was conducted in accordance with the Declaration of Helsinki.

Informed Consent: All participants were given both verbal and written information about the study, and written informed consent was obtained from each participant.

FOOTNOTES

Authorship Contributions

Surgical and Medical Practices: B.D.H., Ş.A., Consept: B.D.H., Ş.A., Design: B.D.H., Ş.A., R.M., Data Collection or Processing: Ş.A., Analysis or Interpretation: R.M., Literature Search: B.D.H., Ş.A., R.M., Writing: B.D.H.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: This study was conducted within the scope of the TÜBİTAK 2209-A Research Project Support Program for Undergraduate Students (project no: 2209-A/1919B012322504).

REFERENCES

1. Collaborators GT. Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990-2019: a systematic analysis from the Global Burden of Disease Study 2019. Lancet. 2021;397:2337-60. Erratum in: Lancet. 2021;397:2336.
2. Kurtuluş Ş, Can R. Use of e-cigarettes and tobacco products among youth in Turkey. Eurasian J Med. 2022;54:127-132.
3. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. 5th ed. Washington (DC): American Psychiatric Association; 2013.
4. West R. Tobacco smoking: health impact, prevalence, correlates and interventions. Psychol Health. 2017;32:1018-36.
5. National Center for Chronic Disease Prevention and Health Promotion (US), Office on Smoking and Health. The health consequences of smoking-50 years of progress: a report of the Surgeon General. Atlanta (GA): Centers for Disease Control and Prevention (US); 2014.
6. Kenfield SA, Wei EK, Rosner BA, Glynn RJ, Stampfer MJ, Colditz GA. Burden of smoking on cause-specific mortality: application to the nurses' health study. Tob Control. 2010;19:248-54.
7. Park JH, Kang S-W, Lee SC, Choi WA, Kim DH. How respiratory muscle strength correlates with cough capacity in patients with respiratory muscle weakness. Yonsei Med J. 2010;51:392-7.
8. Patankar LH, More M, Sonawane DR, Kanabar A. Clinical study of Shaman Dhoompan in cigarette smokers with peak expiratory flow rate. World J Pharm Res. 2021;10:1359-74.
9. Trofor A, Miron R, Buculei I, Puiu L, Man MA. "Lung age" - a motivational smoking cessation tool in smokers with chronic obstructive pulmonary disease. Tob Induc Dis. 2018;16(Suppl 1):A309.

10. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39:175-91.
11. Beck TW. The importance of a priori sample size estimation in strength and conditioning research. J Strength Cond Res. 2013;27:2323-37.
12. Uysal MA, Kadakal F, Karşidağ C, Bayram NG, Uysal O, Yilmaz V. Fagerstrom test for nicotine dependence: reliability in a Turkish sample and factor analysis. Tuberk Toraks. 2004;52:115-21.
13. Uysal A. Solunum fonksiyon testleri: spirometri, PEF ölçümü, DLCO endikasyonlari ve uygulama teknik bilgileri. Thorac Res Pract. 2011;12:1.
14. Birring S, Prudon B, Carr A, Singh S, Morgan M, Pavord I. Development of a symptom specific health status measure for patients with chronic cough: Leicester Cough Questionnaire (LCQ). Thorax. 2003;58:339-43.
15. Akış Gönan N, Havlucu Y, Yorgancıoğlu A, Göktaş T, Akış Gönan N. Reliability and validity of a Turkish version of Leicester Cough Questionnaire. Eur Respir J. 2015;46(Suppl 59):PA3949.
16. Abdelaal AAM, Mousa GSM. Impact of cigarettes smoking on undergraduates' lung health and functional performance: observational cross-sectional study. Int J Prev Med. 2022;13:59.
17. Wali SO. Smoking habits among medical students in Western Saudi Arabia. Saudi Med J. 2011;32:843-8.
18. Hamari A, Toljamo T, Nieminen P, Kinnula VL. High frequency of chronic cough and sputum production with lowered exercise capacity in young smokers. Ann Med. 2010;42:512-20.
19. Chaffee BW, Barrington-Trimis J, Liu F, Wu R, McConnell R, Krishnan-Sarin S, et al. E-cigarette use and adverse respiratory symptoms among adolescents and young adults in the United States. Prev Med. 2021;153:106766.
20. Nighute S, Buge K, Kumar S. Effect of cigarette smoking on peak expiratory flow rate: a short review. Int J Curr Res Physiol Pharmacol. 2017;3:3-5.
21. McConnell R, Barrington-Trimis JL, Wang K, Urman R, Hong H, Unger J, et al. Electronic cigarette use and respiratory symptoms in adolescents. Am J Respir Crit Care Med. 2017;195:1043-9.
22. Sawant GV, Kubde SR, Kokiwar PR. Effect of smoking on PEFR: a comparative study among smokers and non-smokers in an urban slum community of Hyderabad, India. Int J Community Med Public Health. 2016;3:246-50.
23. Naznin R, Nessa A, Nazrina S. Effect of cigarette smoking on peak expiratory flow rate. J Armed Forces Med Coll Bangladesh. 2019;15:165-7.
24. Meena S, Manikandan R. Peak expiratory flow rates in age matched smokers and non-smokers in a tertiary care hospital. Int Arch Integr Med. 2018;5:23-8.
25. Bohadana A, Teculescu D, Martinet Y. Mechanisms of chronic airway obstruction in smokers. Respir Med. 2004;98:139-51.
26. Medabala T, Rao B, MI GM, Kumar P. Effect of cigarette and cigar smoking on peak expiratory flow rate. J Clin Diagn Res. 2013;7:1886-9.
27. Voll-Aanerud M, Eagan TM, Plana E, Omenaas ER, Bakke PS, Svanes C, et al. Respiratory symptoms in adults are related to impaired quality of life, regardless of asthma and COPD: results from the European community respiratory health survey. Health Qual Life Outcomes. 2010;8:107.
28. Ternesten-Hasséus E, Larsson S, Millqvist E. Symptoms induced by environmental irritants and health-related quality of life in patients with chronic cough-A cross-sectional study. Cough. 2011;7:1-8.
29. Krishna G, Jose AM, Rahali W, Alyamani W, Mohammed M, Alghamdi B, et al. Long-term cardiopulmonary outcomes and quality of life: a comparative study among cigarette, electronic cigarette and dual use consumers. Research Square (Research Square). 2023;1-18.